

## CLAIMS

1. An electrochemical generator comprising a multiplicity of membrane fuel cells provided with a reticulated gaseous reactant distributor, a multiplicity of cooling cells fed with liquid water, a device for feeding the gaseous reactants in a dry state and a device for humidifying at least one of said gaseous reactants and for withdrawing heat by permeation of part of said liquid water fed to said cooling cells across a multiplicity of metallic porous walls separating said fuel cells from said cooling cells, and by evaporation of said liquid water permeated to the interior of said fuel cells.
2. The generator of claim 1 wherein one of said cooling cells is interposed between each consecutive pair of said membrane fuel cells.
3. The generator of the previous claims wherein said porous walls consist of a metal sintered material with controlled permeability or of a metal fibre interlacement, optionally supported on a metal mesh or on an expanded or perforated sheet.
4. The generator of the previous claims wherein said porous walls comprise a peripheral sealing frame.
5. The generator of the previous claims wherein said porous walls are superficially modified with a hydrophobic material on at least one face.
6. The generator of claim 5 wherein said hydrophobic material is a fluorinated polymer.
7. The generator of the previous claims wherein said reticulated gaseous reactant distributor has a fluid passage resistance substantially lower than that of said porous walls.
8. The generator of the previous claims wherein said reticulated gaseous reactant distributor is an element selected from the group of metal sponges or foams, of meshes, of expanded or perforated sheets or a superposition of such elements.
9. The generator of the previous claims wherein said reticulated gaseous reactant distributor is metallic, and optionally made of stainless steel, nickel or nickel alloy.

10. The generator of the previous claims wherein said cooling cells comprise a conductive reticulated element to ensure the electric continuity.
11. The generator of claim 10 wherein said conductive reticulated element of said cooling cells has a fluid passage resistance substantially lower than that of said porous walls.
12. The generator of claim 10 or 11 wherein said conductive reticulated element of said cooling cells is an element selected from the group of metal sponges or foams, of meshes, of expanded or perforated sheets or a superposition of such elements.
13. The generator of claims 10 to 12 wherein said conductive reticulated element of said cooling cells is metallic, and optionally consisting of stainless steel, nickel or nickel alloy.
14. A method for generating direct electric current, comprising feeding at least one dry gaseous reactant to said membrane fuel cells of the previous claims, supplying a water flow to said cooling cells at a controlled pressure higher than that of said at least one gaseous reactant to be humidified, and allowing said water flow to permeate to said membrane fuel cells across said multiplicity of porous walls.
15. The method of claim 14 wherein the gaseous reactant humidified by said flow of water permeating across said porous wall is oxygen.
16. The method of claim 14 wherein both gaseous reactants are humidified by said flow of water permeating across said porous walls.
17. The method of claims 14 to 16 wherein said flow of water is preheated.
18. An electrochemical generator comprising the distinctive elements of the description and the figures.